

# **PERFORMANCE MAINTENANCE DURING CONTINUOUS FLIGHT OPERATIONS**



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# References

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## ✈ Aeromedical Guidance

- BUMED Publication NAVMED P-6410

## ✈ Operational Guidance

- OPNAVINST 3710.7S
- CNAFINST 6410.1



# PERFORMANCE MAINTENANCE DURING CONTINUOUS FLIGHT OPERATIONS





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# OUTLINE

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- ✈️ **Definitions And Topics**
- ✈️ **USAF Experience In Desert Storm**
- ✈️ **Strategies and Ideas**
- ✈️ **Performance Maintenance Vice Enhancement**
- ✈️ **Anti-fatigue Medications**



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# OPERATIONS THAT PRODUCE FATIGUE

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## ✈ CONTINUOUS OPERATIONS?

- Extend Over 24 Hours
- Not Necessarily Longer Hours
- Circadian Rhythm Conflict

## ✈ SUSTAINED OPERATIONS?

- Continuous *Beyond 24 Hours*
- Work Until A Goal Is Reached
- Sleep Deprivation Common



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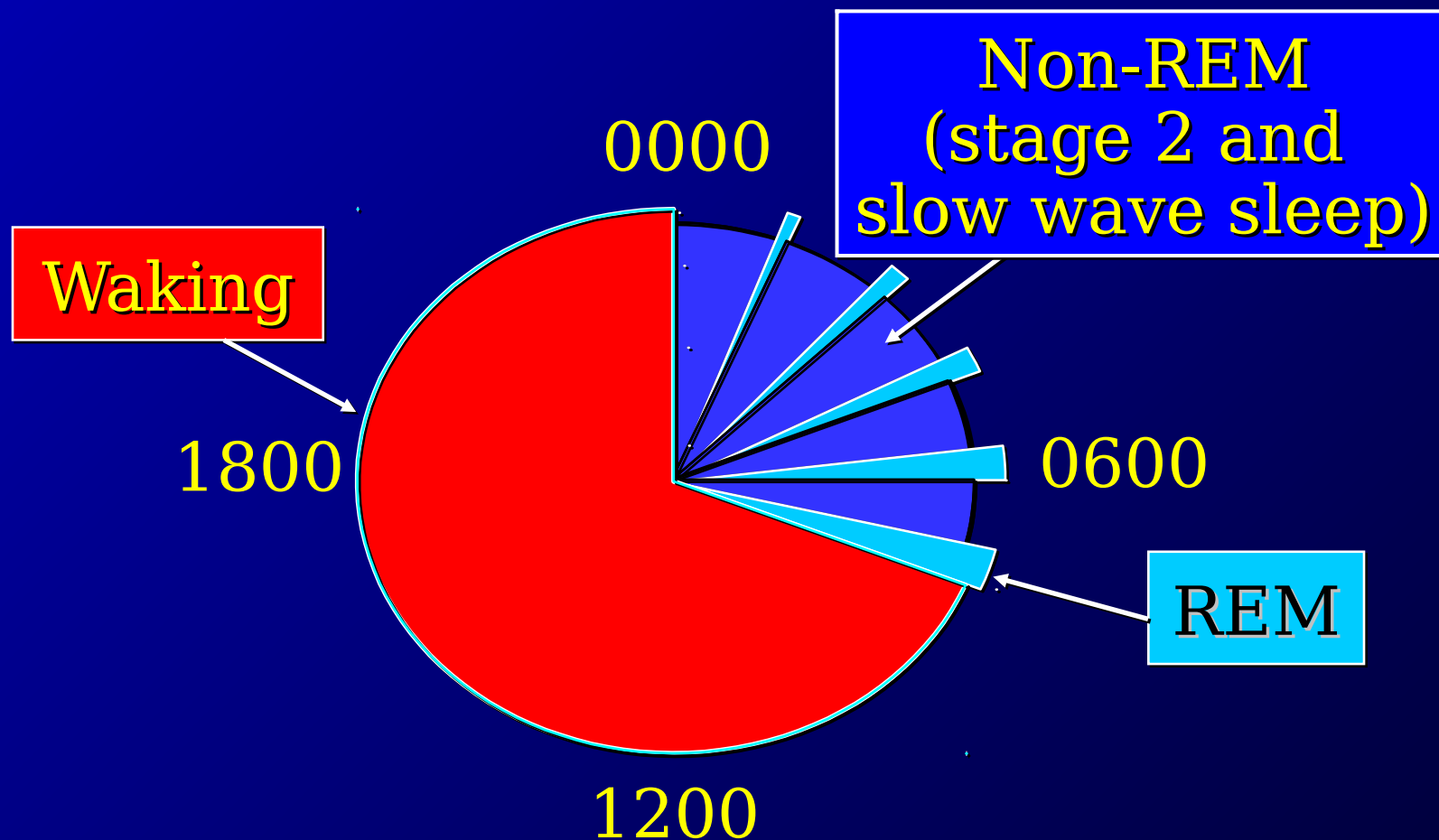
# SLEEP

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- ✈️ **Preload**
- ✈️ **Total Amount Vs Specific Stage**
- ✈️ **Combat Naps Work**
- ✈️ **Sleep Inertia**
- ✈️ **Easiest After Lunch**
- ✈️ **10 Hours Is Max Effective Period**
- ✈️ **Caffeine**



# The 24-Hour Sleep/Wake Cycle







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# CIRCADIAN RYTHMS

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- ✈ **NUMEROUS CYCLIC RHYTHMS**
- ✈ **DESYNCHRONIZATION**
  - **External**
  - **Internal**
- ✈ **PERFORMANCE**
  - **Best 1200-2100**
  - **Worst 0300-0600**
- ✈ **7 DAYS TO ADJUST**





# FATIGUE



## ✈️ ACUTE

- Physical Exertion / Sleep Loss
- Alleviated By Single Rest Period

## ✈️ CHRONIC

- Medical or Psychological

## ✈️ OPERATIONAL

- Sleep Loss / Desynchronization
- Produced by Continuous Operations
- Seen After 3-4 Days
- Not Alleviated by a Single Rest PERIOD



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# PERFORMANCE

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## ✈️ **MANY SKILLS RESISTANT**

- **T/O, Landing, Rendezvous, Bombing, Etc.**

## ✈️ **SOME EASILY DEGRADED**

- **Vigilance, Judgment, Situational Awareness, Staying Awake**

## ✈️ **PERFORMANCE DETERMINED BY:**

- **Type Of Task**
- **Preload**
- **Time Of Day**
- **Arousal**



# EFFECTS OF FATIGUE AND SLEEP LOSS ON FLIGHT CREW PERFORMANCE

✈ Increased reaction time leads to:

- 1) Timing errors in response sequences
- 2) Less smooth control

✈ Reduced attention leads to:

- 1) Preoccupation with single tasks or elements
- 2) Reduced audiovisual scan

✈ Diminished memory leads to:

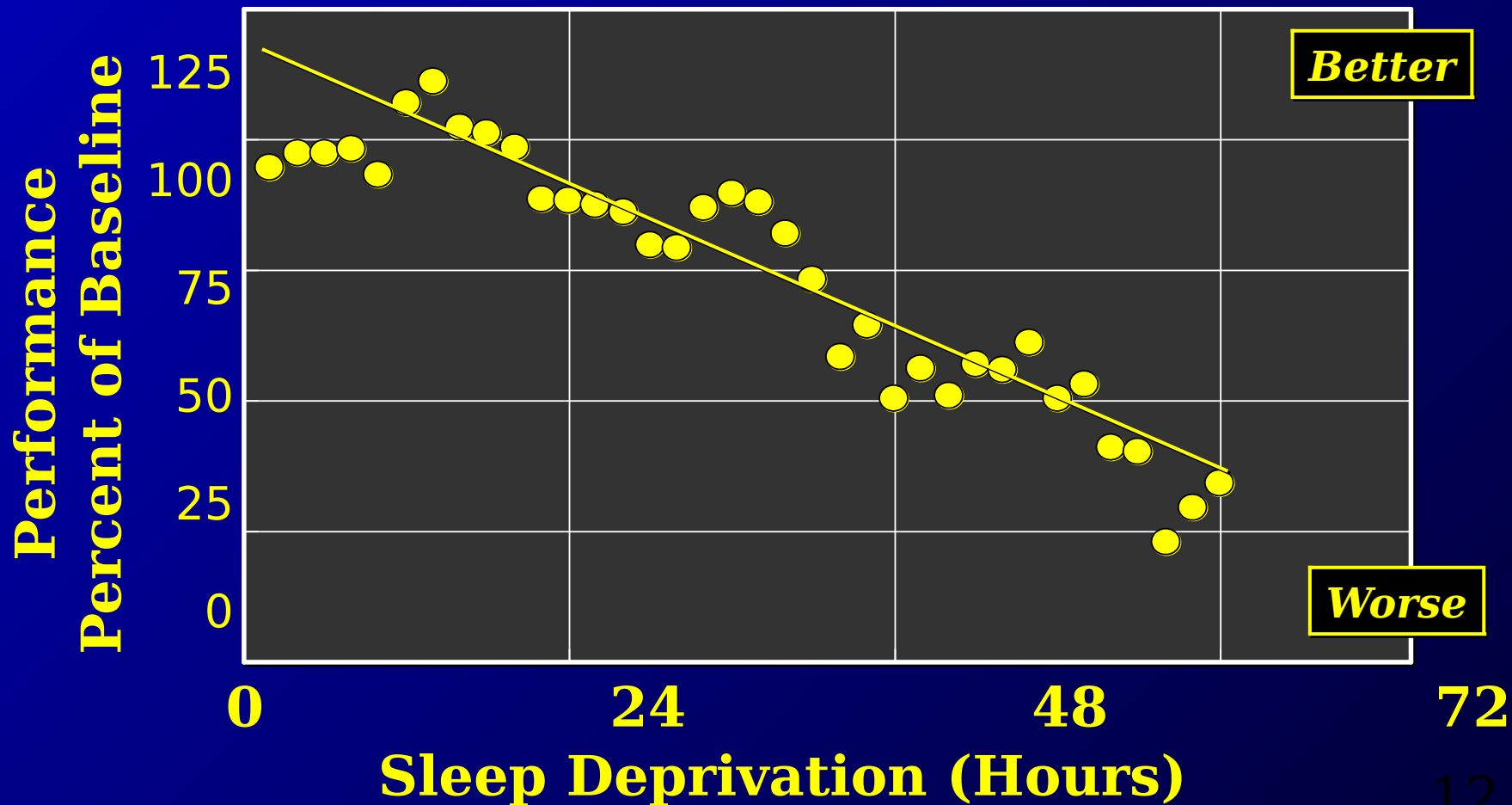
- 1) Forget peripheral tasks
- 2) Revert to “old” habit patterns

✈ Withdrawn mood leads to:

- 1) Less likely to converse
- 2) Less likely to perform low-demand tasks

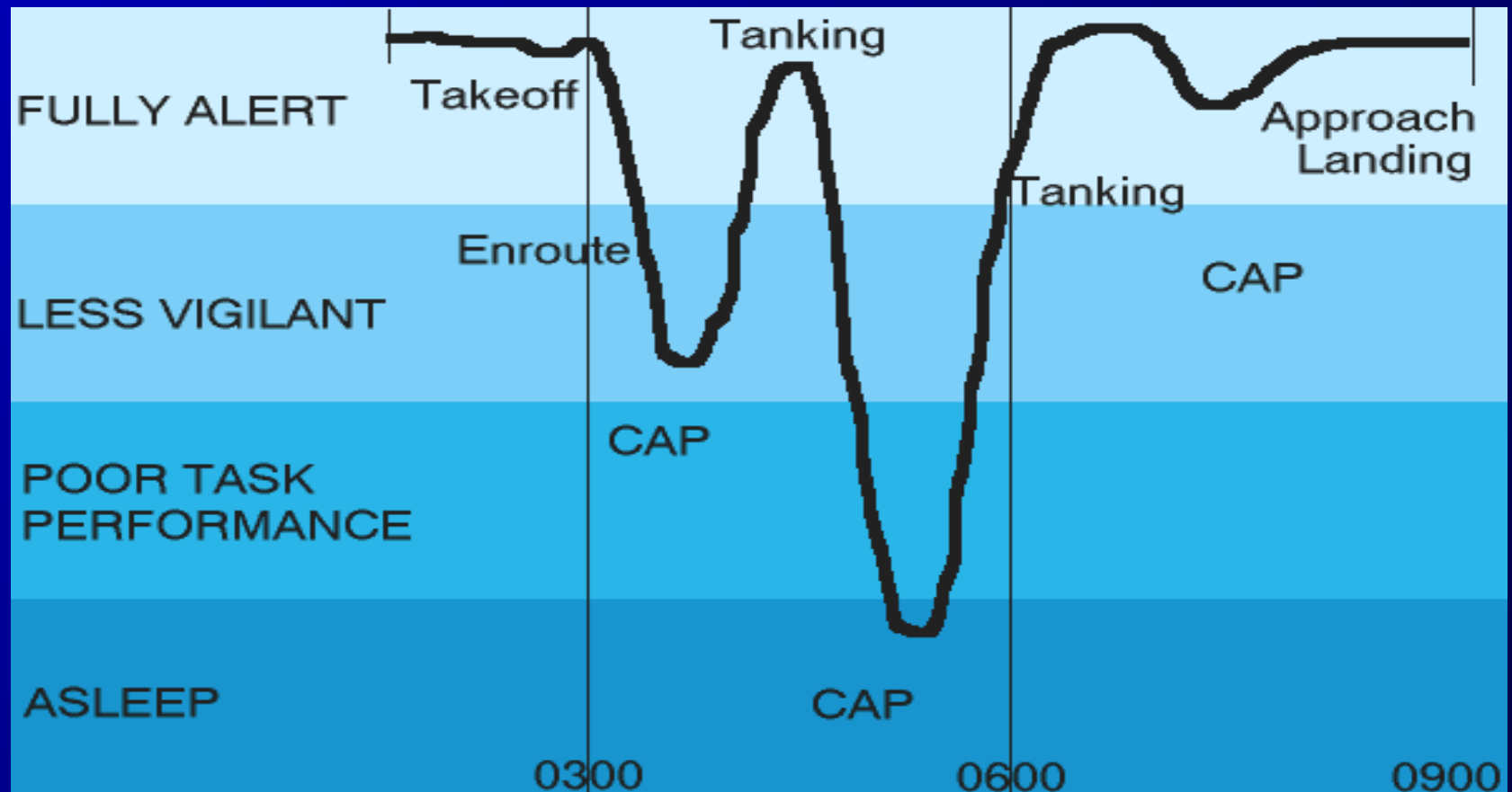


# 72 Hours of Total Sleep Deprivation: Effect on Complex Mental Operations





# PROJECTED VIGILANCE FOR LONG RANGE MISSIONS





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# SLEEP QUESTIONS

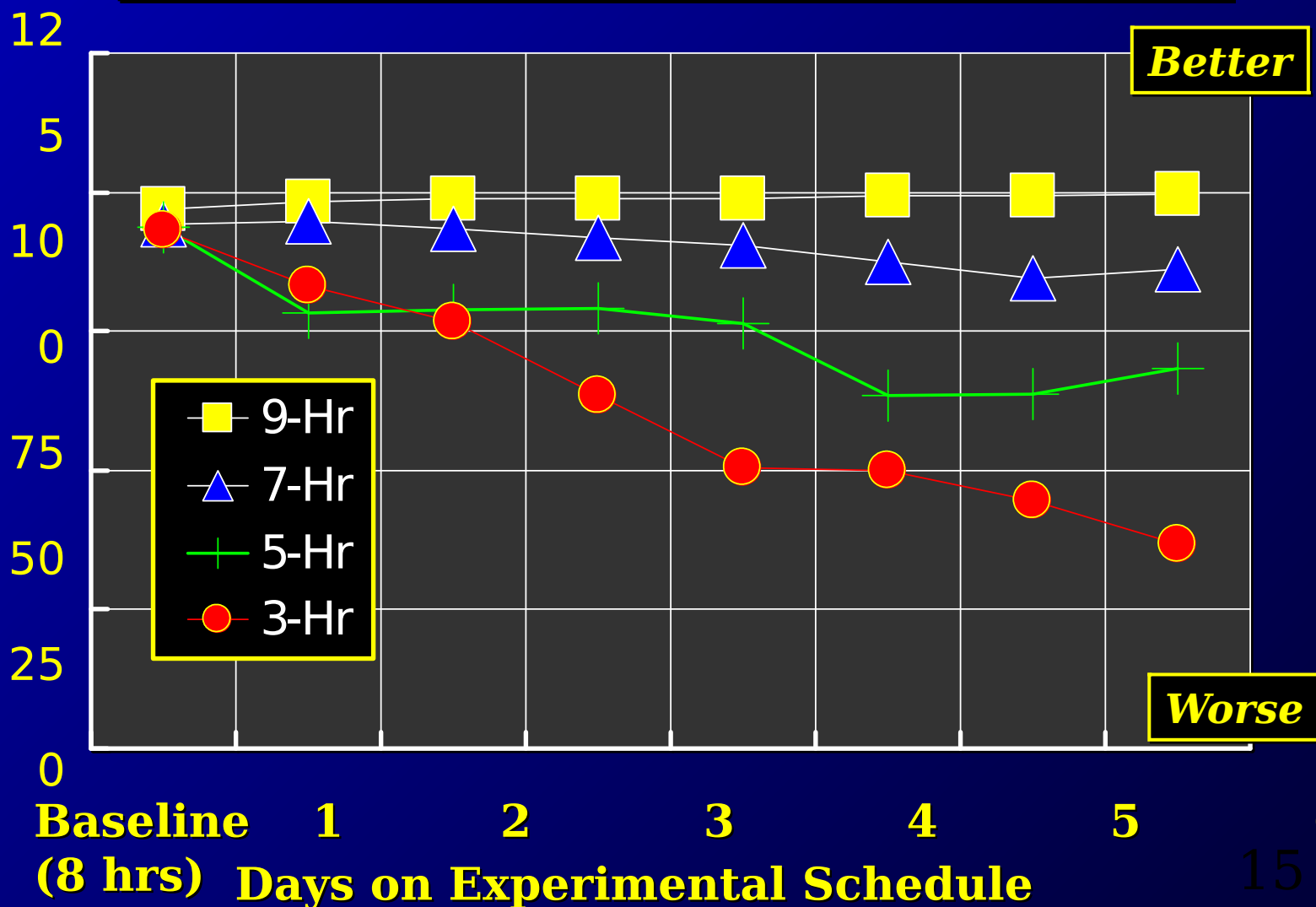
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- ✈ Can we get by with less than 8 hours of sleep?
- ✈ Effect of Restricting Sleep Time on Mental Operations



# Restricting Sleep: Effects on Vigilance

Response Speed  
Performance  
Percent of Baseline







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# USAF EXPERIENCE IN DESERT STORM

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- ✈️ **Anonymous post Desert Storm Survey from fighter pilots**
  - **464/1080 survey's returned (43%)**
  - **57% used stimulants at some time**
    - **17% routinely**
    - **58% occasionally**
    - **25% only once**
  - **61% of those who used stimulates reported their use *essential* to mission accomplishment**



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# USAF EXPERIENCE IN DESERT STORM

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## ✈️ F-15 SQUADRON Deployed to Saudi Arabia

- 35 Pilots, 1,200 Sorties, 7,000 Hours
- 16 MIG Kills

## ✈️ MEDICATION

- Go-Pill (5 mg Dexedrine)
- No-Go Pill (15-30 mg Restoril)

## ✈️ CO REQUIRED GO-PILL IN A/C

## ✈️ DECISION DELEGATED TO PILOTS



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# USAF EXPERIENCE IN DESERT STORM

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- ✈ STIMULANT USED 0200 - SUNRISE
- ✈ SEDATIVE USED LESS
- ✈ NO ADVERSE REACTIONS OR ABUSE
- ✈ PILOT OPINIONS NEUTRAL TO POSITIVE
- ✈ "MADE YOU FEEL JUST LIKE YOU DO NOW"



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# STRATEGIES AND IDEAS: SQUADRON

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- ✈ **FATIGUE IS A COMMODITY TO BE MANAGED**
- ✈ **EVERYONE IS DIFFERENT**
- ✈ **PREPARATION CREATES SIGNIFICANT PRELOAD**
- ✈ **4-5 HOURS PER NIGHT**
- ✈ **MAKE PEOPLE GO TO BED**
- ✈ **THE TROUGH**
- ✈ **CHANGE IN SQUADRON DYNAMICS**



# STRATEGIES AND IDEAS: INDIVIDUAL

- ✈ **MANAGE WHAT YOU CAN**
- ✈ **NUTRITION, HYDRATION AND PHYSICAL  
CONDITIONING**
- ✈ **UNLESS IT IS IMPORTANT - GO TO BED**
- ✈ **CAFFEINE**
  - **Know to improve cognitive performance but less effective in maintaining alertness**
  - **Low abuse potential, use sparingly when not REQUIRED**
- ✈ **COMBAT NAPS WORK**
  - **10" TO 10 Hrs**
- ✈ **SLEEP INERTIA**



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# COMBAT NAPS

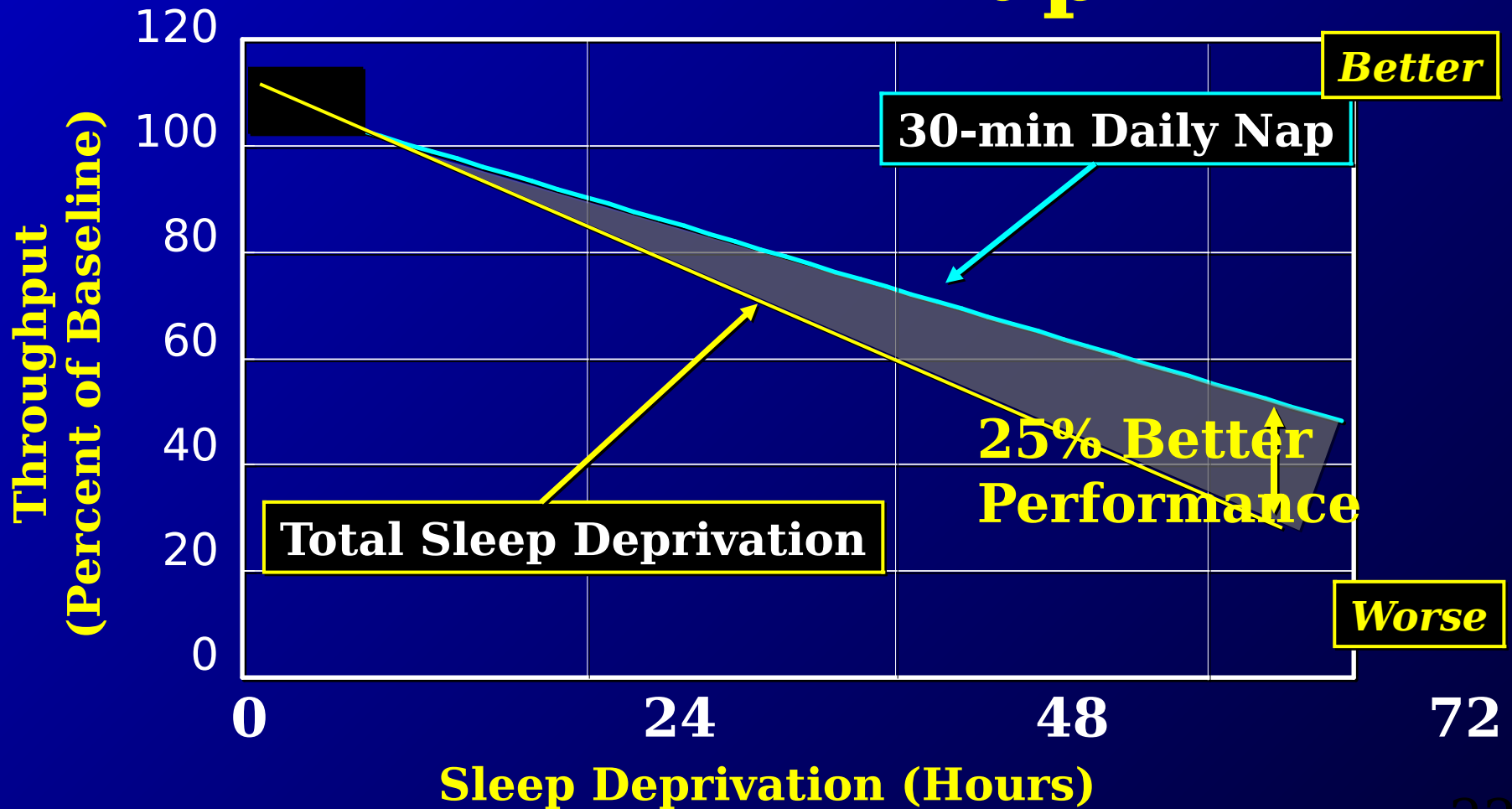
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# Recuperative Value of Sleep: Daily 30- min “Nap”







# PHILOSOPHY OF MEDICATION USE

- ✈ PERFORMANCE ENHANCEMENT
- ✈ PERFORMANCE MAINTENANCE





# DOCTRINAL BASE FOR STIMULANT USE

## ✈ OPNAVINST 3710.7S 8.3.3 Performance Maintenance During Continuous and Sustained Operations.

- **"Operational commitments may necessitate continuous and/or sustained operations in which sleep and circadian rhythms are disrupted, leading to potentially hazardous fatigue. NAVMED P-6410 (01 Jan 2000), Performance Maintenance During Continuous Flight Operations, A Guide for Flight Surgeons, provides background on the subject, strategies for fatigue reduction, and guidance in the use of sleep-inducing and anti-fatigue medications ("no-go pills" and "go-pills") in aircrew.**
- **Commanding Officers, in consultation with their Flight Surgeons, are authorized to use any of the strategies described in the guide when mission requirements and operational risk management indicate use would be appropriate."**



# **DOCTRINAL BASE FOR STIMULANT USE (Cont)**

## **✈ CNAF Instruction 6410.1**

### **➤ Adds to 3710 instruction**

- Authorization shall have concurrence of Air Wing Commander or equivalent (see inst)**
- TYCOM Force Medical shall be notified prior to use of medications**

### **➤ After Action Report**

- Sent via Operational Chain of command to NAMI**

### **➤ Do not carry sedatives in aircraft.**



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# **THE PERFORMANCE MAINTENANCE MANUAL**

**(Navy Medicine Publication P-6410)**

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- ✈ **Navy Med Pub P-6410 defines guidelines for the use of amphetamines to enhance performance as follows:**
- **The use of stimulants or sedatives is appropriate only in combat or during exceptional circumstances of operational necessity. The commanding officer, following consultation with the Air Wing Commander (or his equivalent) and Flight Surgeon, may authorize the use of stimulants and/or sedatives for pilots, NFO's, and air crewman. The Flight Surgeon will consult with his supervisor in the Aeromedical Chain of Command.**



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# THE PERFORMANCE MAINTENANCE MANUAL

## (Navy Medicine Publication P-6410)

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### ✈ **Ground rules guiding the use of these drugs:**

1. Ground testing must be completed prior to operational use of these medications.
  - **No flying will be done the day of the pretest.**
  - **For CVW squadrons this means...prior to deployment**
  - **A standardized SF-600 entry is placed in the aviator's medical record and an informed consent form is completed and signed by the member and placed in his medical record.**
  - **Recommended for you to keep a list of who has been pre-tested and who has not.**
2. **Aviators and supervisory personnel must be fully briefed on the proper use of the medications and the possible side-effects.**
3. The Commanding Officer must have properly authorized use of the medication. The Flight Surgeon must have consulted with his supervising medical officer.



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# **THE PERFORMANCE MAINTENANCE MANUAL**

## **(Navy Medicine Publication P-6410)**

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### **✈ Ground rules guiding the use of these drugs (continued):**

- 4. The medications are issued in the amounts required for one or two flights and the issue is documented in the medical record.**
- 5. Flight Surgeon must provide close oversight of the use of these medications as well as the fatigue levels of his/her aviators. Flight Surgeon must pay particular attention to possible interactions with over-the-counter medications that might be being illegally used by an aviator.**
- 6. All unused medication must be collected by the Flight Surgeon at the end of the continuous operations.**
- 7. The only authorized amphetamine for use in Naval and Marine Corps Aviation is Dextroamphetamine (Dexedrine), not to exceed 30 mg in a 24 hour period.**





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# **THE PERFORMANCE MAINTENANCE MANUAL**

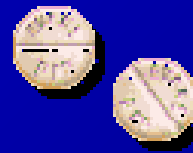
**(Navy Medicine Publication P-6410)**

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## **✈ Final Ground Rule (continued):**

- 8. NAVMED P-6410 Requires an “after-action” report to be submitted to the AAC/Code-42 NAMI.  
(Per CNAFINST 6410.1 route via operational chain of command)**





# STIMULANTS

## ✈️ DEXTRO-AMPHETAMINE (DEXEDRINE)

- 5 mg Initial Dose, Repeat in 15 Minutes if Required
- 5 mg Every 2 Hours Thereafter
- No More Than 30 mg per 24 hrs
- Informed Consent Form Requirement

## ✈️ DESIRED EFFECTS

- Maintain Alertness, Focus Attention, Elevate Mood

## ✈️ ADVERSE REACTIONS / PROBLEMS

- Insomnia, Over-focusing, Abuse
- Cyclic Use With Sedatives
- Decreased Appetite
- Elevated Blood Pressure



# SEDATIVES

## ✈️ TREATS THE PROBLEM

- Good Quality of Sleep

## ✈️ AMNESIA

## ✈️ ZOLPIDEM (AMBIEN)



- 5-10 mg Before Bed / 10 mg per 24 Hrs Max
- 6 Hours Down

## ✈️ TEMAZEPAM (RESTORIL)



- 15 mg Before Bed / 15 mg per 24 Hrs Max
- No More Than Two Days of Consecutive Use
- 7 Hours Down

**✈️ \*AVOID INADVERTENT USE\* - DO NOT CARRY SEDATIVES IN THE COCKPIT!**



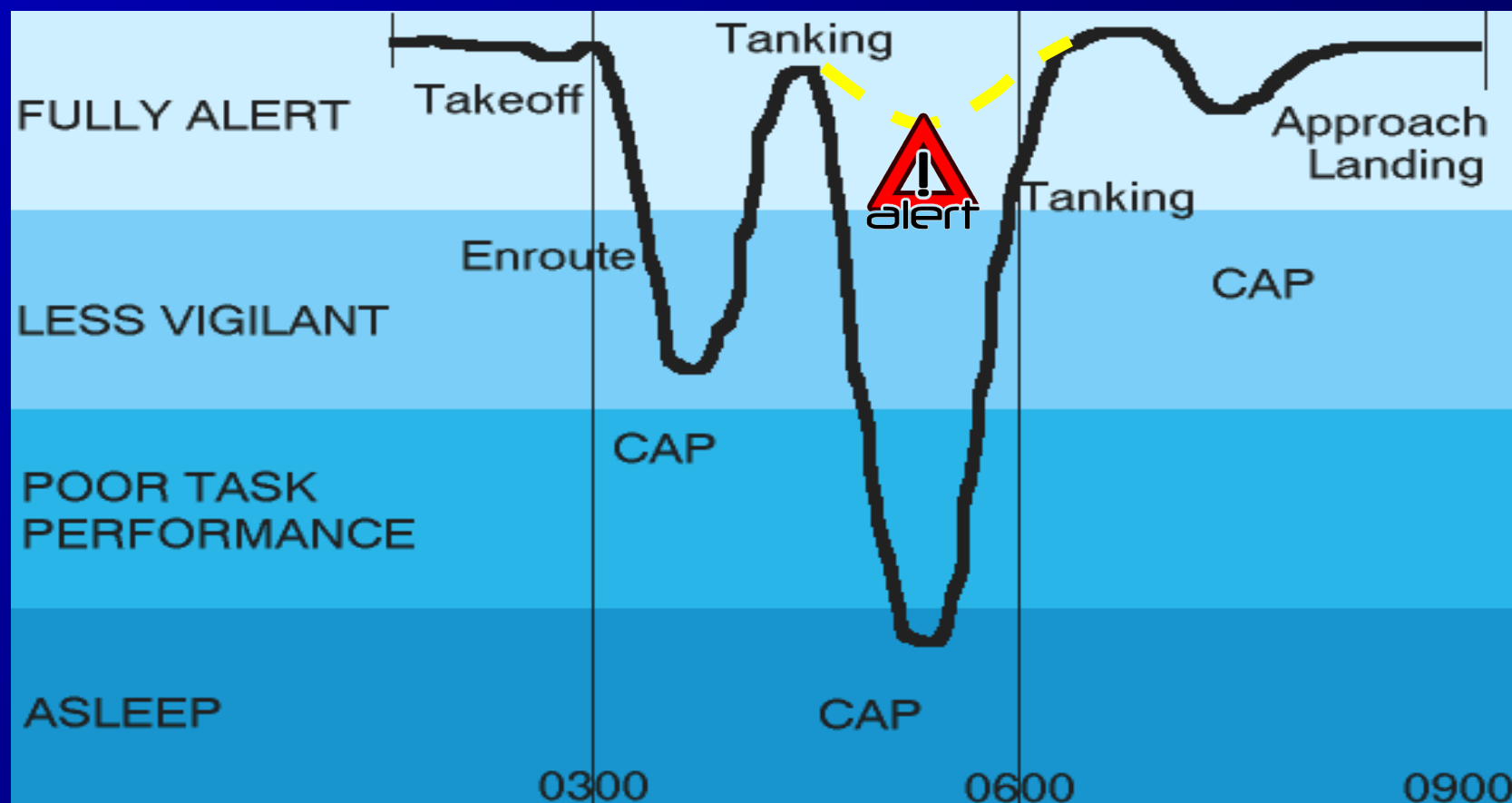
# RISK OF NEGATIVE PRESS



- ✈ The Naval Safety Center supports the use of these meds in appropriate situations.
  - “Combat or exceptional operational necessity”
- ✈ However, when implementing use of these guidelines it is very important to strictly follow the guidelines in OPNAVINST 3710.7S, CNAFINST 6410.1 and NAVMED P-6410!
- ✈ Remember the use of the pharmacological intervention strategies is designed to be used during times of extreme operational necessity and only after the non-pharmacological strategies have been found to be inadequate to manage fatigue



# OPTIMAL OUTCOME FROM DEXADRINE





# WHAT'S IT ALL ABOUT





# *Questions*

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